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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,786	01/10/2002	Satoshi Seo	07977/291001/US5434	9114

7590 10/05/2004  
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EXAMINER
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ROY, SIKHA

ART UNIT	PAPER NUMBER
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2879

DATE MAILED: 10/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/043,786

Applicant(s)

SEO ET AL.

Examiner

Sikha Roy

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 September 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2-15,17-31,33-35,37,40-47 and 54-56 is/are pending in the application.
- 4a) Of the above claim(s) 48-53 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-15,17-31,33-35,37,40-47 and 54-56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION**

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 7, 2004 has been entered.

Cancellation of claims 1,16,32,36,38 and 39 and addition of new claims 54-56 have been entered.

***Specification***

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). In claims 2,4 and 25 the limitation reciting 'a third material doped as a guest in only a portion of the mixed region' has not been disclosed in written description.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 55 and 56 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which

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applicant regards as the invention. Claims 55 and 56 depend on claims 35 and 37 respectively which depending on claim 25 recite the second organic compound is low molecular weight compound. Hence the limitation of claims 55 and 56 reciting 'second organic compound is a material selected from the group consisting of polyparaphenylenevinylene derivative, polydialkylfluorene derivative, polyvinylcarbazole derivative and polyphenylene derivative' is inconsistent, these compounds are high molecular weight compounds (as in claim 15). The examiner notes that these claims could not be examined because of contradicting limitations.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 3, 25, 30, 31, 40-42, 45, 47 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,392,250 to Aziz et al. ('250).

Aziz ('250) discloses (column 5 lines 10-30, column 8 lines 19-32 Fig. 2) organic light emitting device 30 comprising an anode 34, a cathode 42, an organic compound layer 38 interposed between the anode and the cathode comprising a hole transport compound and an electron transport compound, wherein the hole transport material includes polyaniline a high molecular weight compound. Aziz discloses the mixed

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region 38 in which two compounds for hole transport and electron transport materials are mixed is located apart from the anode and cathode. Furthermore Aziz discloses the mixed region further comprises third material (dopant) doped as guest while the hole transport and electron transport compounds are hosts.

Regarding claim 2 Aziz discloses the claimed invention except for the third material doped as guest in only a portion of the mixed region. It would have been an obvious matter of design choice to have the third material doped as in only a portion of the mixed region since the applicant has not disclosed this configuration of the guest material only in a portion of the mixed region solves any of the stated problems or is for any particular purpose and it appears that the invention would perform equally well with the guest material in the mixed region.

Regarding claim 3 Aziz ('250) discloses (column 5 lines 25-28) the guest luminescent compound (dopant) demonstrate light emission (acting as emitter).

Regarding claim 25 Aziz('250) discloses organic light emitting device comprising an anode, a cathode, an organic compound layer interposed between the anode and the cathode comprising a first organic compound (polyaniline for hole transport material) which is a high molecular weight compound and a second organic compound (stilbene derivative, tris(8-hydroxyquinolate) aluminum ( $\text{Alq}_3$ ) - for electron transport material) which is a low molecular compound, the first and second compounds are mixed in the mixed region. Furthermore Aziz discloses the mixed region further comprises third material (dopant) doped as guest, different from the first and second organic compounds.

Regarding claim 25 Aziz discloses the claimed invention except for the third material doped as guest in only a portion of the mixed region. It would have been an obvious matter of design choice to have the third material doped as in only a portion of the mixed region since the applicant has not disclosed this configuration of the guest material only in a portion of the mixed region solves any of the stated problems or is for any particular purpose and it appears that the invention would perform equally well with the guest material in the mixed region.

Regarding claim 30 Aziz discloses the first organic compound a hole transport compound and the second organic compound ( $\text{Alq}_3$ ) known as light emitting compound.

Regarding claims 31 and 54 Aziz discloses (column 8 lines 19-32) the first organic compound is selected from polyaniline, and its acid-doped forms, poly(phenylene vinylene), porphyrin derivatives which are high-molecular weight compounds inherently including pi electrons.

Claim 40 essentially recites the same limitation as of claim 2 and hence is rejected for the same reason.

Regarding claims 41, 42, 45 and 47 Aziz ('250) discloses (column 11 line 61 through column 12 line 3) the third organic luminescent compound is selected from metal complex having platinum as central metal ( $\text{PtOEP}$ ) and a metal complex having iridium ( $\text{Ir(ppy)}_3$ ) as central metal which inherently demonstrate light emission from a triplet state as evidenced by "High Quantum Efficiency in Organic Light-Emitting Devices with Iridium-Complex as Triplet Emissive Center" by Tsutsui et al. (Literature 8).

Claims 4, 9-15, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Publication 2003/0132704 to Aziz et al. ('704).

The Examiner notes that U.S. Patent Publication 2003/0132704 to Aziz et al. is a Division of application 09/629,163 which has filing date of July 31, 2000 and hence is available as prior art 102(e) reference. It is recognized that the two applications have the same disclosure and U.S. PG Pub 2003/0132704 to Aziz et al. ('704) is only used for referencing the elements of the claims.

Regarding claim 4 Aziz ('704) discloses (Fig. 3 [0034], [0035]) an organic light emitting device 200 comprising an anode 214, a cathode 218 and an organic compound layer interposed between the anode and the cathode comprising a first organic compound, polyaniline, polythiophene, a hole transport material ([0067]) and a second compound, polyfluorenes an electron transport material ([0075]) both being high molecular weight compounds and different from each other. Aziz ('704) discloses a mixed region 224 where the first and second organic compounds are mixed. Furthermore Aziz discloses ([0077]) the mixed region 224 comprises a third organic compound different from first and second organic compounds which is a dopant material.

Regarding claim 4 Aziz discloses the claimed invention except for the third material doped as guest in only a portion of the mixed region. It would have been an obvious matter of design choice to have the third material doped as in only a portion of the mixed region since the applicant has not disclosed this configuration of the guest

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material only in a portion of the mixed region solves any of the stated problems or is for any particular purpose and it appears that the invention would perform equally well with the guest material in the mixed region.

Regarding claim 9 Aziz ('704) discloses first compound is a hole transport compound and the second organic compound, polyfluorenes demonstrate light emission ([0067],[0056])

Regarding claims 10 and 11 Aziz('704) discloses the first organic compounds are polyanilines, polythiophenes, polyarylamines and their derivatives which are high molecular weight compounds, chemically doped and inherently include pi electrons.

Regarding claim 12 Aziz ('704) discloses the second compound is polyfluorene derivative.

Regarding claims 13-15 Aziz ('704) discloses (claims 7,8, [0054]) first organic compound is an electron transport material having high molecular weight including pi electrons and the second compound is a light emitting material selected from a group consisting of poly(p-phenylenevinylene).

Regarding claim 17 Aziz ('704) discloses ([0035], [0036], [0037]) the first organic compound is a hole transport material, second organic compound is an electron transport material and the third organic compound is light emitting dopant material. Aziz further discloses the suitable dopant materials can be selected from fluorescent dyes or phosphorescent material demonstrating light emission.



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Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PG Pub 2003/0132704 to Aziz et al. ('704) and further in view of U.S. Patent 5,925,980 to So et al.

Claim 5 differs from Aziz ('704) in that Aziz ('704) does not exemplify the concentration of the first and second organic compounds changing continuously in the mixed region.

So in analogous art of organic electroluminescent device with graded region discloses (abstract) the graduated region between the hole transporting region and electron transporting region changes continuously in the mixed region. So further discloses (column 4 lines 13-25) because of continuous change from hole transporting to electron transporting organic material the two materials are intermixed and disseminated so that no fixed interface is formed and adhesion problem of the two layers is resolved. The mixed region appears as a single layer of material which cannot separate and generally allows a smooth movement of carriers there across. This results in an improved organic electroluminescent device with improved reliability and operation (column 1 lines 60-65).

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the mixed region of Aziz ('704) as continuous region as taught by So for resolving the problem of adhesion of two organic layers, smooth movement of carriers across the mixed region and resulting in an improved organic electroluminescent device with improved reliability and operation.

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Claim 6 essentially recites the same limitations as of claim 5 and hence is rejected for the same reason. The recitation of continuous change in the first and second organic compounds in the mixed region is detected by SIMS has not been given patentable weight because it is considered as an intended use recitation. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations.

Regarding claims 7 and 8 Aziz ('704) discloses ([0068], [0069], [0070]) first and second organic compounds comprise elements of Group 15 to Group 17 selected from group consisting of nitrogen, oxygen, chlorine, fluorine.

Claims 18, 19, 22, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PG Pub 2003/0132704 to Aziz et al. ('704) and further in view of U.S. Patent 6,392,250 to Aziz et al.('250).

Regarding claims 18 and 19 Aziz ('704) does not disclose the third organic luminescent compound having a metal complex having platinum or iridium as central metal which demonstrates light emission from triplet excited state.

Aziz('250) in analogous art of organic light emitting devices discloses (column 11 line 61 through column 12 line 3) the third organic luminescent compound is selected from metal complex having platinum as central metal (PtOEP) and a metal complex having iridium ( $\text{Ir(ppy)}_3$ ) as central metal which inherently demonstrate light emission

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from a triplet state as evidenced by “ High Quantum Efficiency in Organic Light-Emitting Devices with Iridium-Complex as Triplet Emissive Center” by Tsutsui et al. (Literature 8). It is to be noted that this emitters having high quantum efficiency of phosphorescence from triplet state provide high efficient light source.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include luminescent compounds having platinum or iridium as central metal having light emission from triplet state as taught by Aziz ('250) in the third organic compound of dopant material of Aziz ('740) for providing light source with high efficiency.

Regarding claim 22 Aziz ('250) discloses the third organic compound a metal complex comprising a metal element.

Regarding claim 24 Aziz ('250) discloses the metal element selected from group consisting of platinum and iridium.

Claims 33-35 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,392,250 to Aziz et al.('250) and further in view of U.S. PG Pub 2003/0132704 to Aziz et al. ('704).

Regarding claims 33 and 34 Aziz ('250) discloses  $Alq_3$  as light emission material but does not disclose first organic compound with high molecular weight as electron transport compound.

Aziz ('704) discloses high molecular weight compound polydialkylfluorene (polyfluorenes) as electron transport material.

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Selection of known material for a known purpose is within the skill of the art. Therefore it would have been obvious to ordinary skill in the art at the time of invention to use high molecular weight compound, the first compound of Aziz ('250) as electron transport material as suggested by Aziz ('704) because the selection of known materials for a known purpose is within the skill of the art.

Regarding claim 35 Aziz ('704) discloses polyfluorene, the high molecular weight compound as luminescent material and second organic compound with low molecular weight (aromatic tertiary amines) as hole transport compound.

Regarding claim 37 Aziz ('250) and Aziz ('704) disclose first high molecular weight compound polyfluorene, as luminescent material and second organic compound Alq<sub>3</sub> as electron transport compound.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PG Pub 2003/0132704 to Aziz et al. ('704) and in view of U.S. Patent 6,097,147 to Baldo et al.

Regarding claim 20 differs from Aziz ('704) in that Aziz('704) does not disclose the third organic compound having a larger energy difference between the highest occupied molecular orbital and the lowest unoccupied molecular orbital than the first and second organic compounds.

Baldo in analogous art of high efficiency electroluminescent device discloses (Fig. 3 column 3 lines 22-32, column 4 lines 25-36) a blocking layer made from any suitable material (NPD, BCP, CBP) having larger energy difference (band gap) between

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a highest occupied molecular orbital and a lowest unoccupied molecular orbital than the energy gap in first and second organic compounds. Baldo discloses the materials used for blocking layer include any suitable material which substantially prevent diffusion of excitons from the respective layers. Baldo further discloses that thus blocking layer substantially keeps the excitons in the emissive layer and thus enhances device efficiency.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include the material for blocking layer having larger energy difference between a highest occupied molecular orbital and a lowest unoccupied molecular orbital than the energy gap in first and second organic compounds as taught by Baldo as the third organic compound in the doped mixed region of Aziz ('704) for preventing diffusion of excitons and thus enhancing the efficiency of the device.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PG Pub 2003/0132704 to Aziz et al. ('704) and further in view of U.S. 5,281,489 to Mori et al.

Regarding claim 21 Aziz ('704) does not disclose third organic compound selected from group consisting of phenanthroline derivative, oxadiazole and triazole derivative.

Mori in same field of endeavor of electroluminescent element discloses (column 23 line 59, column 24 lines 60-67) fluorescent dyes including phenanthroline derivative, oxadiazole compounds.

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The selection of known materials for a known purpose is generally considered to be within the skill of art. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include fluorescent dyes including phenanthroline derivative, oxadiazole compounds because the selection of known materials for a known purpose is within the skill of the art.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PG Pub 2003/0132704 to Aziz et al. ('704) and U.S. Patent 6,392,250 to Aziz et al. and further in view of U.S. Patent 6,566,807 to Fujita et al.

Regarding claim 23 Aziz ('704) and Aziz ('250) do not disclose the organometallic compound in the third organic compound selected from group consisting of aluminum, zinc and beryllium.

Fujita in analogous art of organic electroluminescent element discloses (column 8 lines 21-26) fluorescent organometallic compound such as azomethine zinc complex.

The selection of known materials for a known purpose is generally considered to be within the skill of art. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include azomethine zinc complex containing zinc as suggested by Fujita in organometallic compound of Aziz('704) and Aziz('250) because the selection of known materials for a known purpose is within the skill of the art.

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Claims 26 - 29 rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,392,250 to Aziz et al. ('250) and further in view of U.S. Patent 5,925,980 to So et al.

Claims 26,27 essentially recite the same limitations as of claims 5,6 respectively and hence are rejected for the same reason (see rejection of 5,6).

Regarding claims 28 and 29 Aziz ('250) discloses first and second organic compounds comprise elements of Group 15 to Group 17 selected from group consisting of nitrogen, oxygen, chlorine, fluorine.

Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,392,250 to Aziz et al. ('250) and further in view of U.S. Patent 6,097,147 to Baldo et al.

Claim 43 essentially recites the same limitations as of claim 20 and hence is rejected for the same reason.

Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent 6,392,250 to Aziz et al. ('250) and further in view of U.S. Patent 5,281,489 to Mori et al.

Claim 44 essentially recites the same limitations as of claim 21 and hence is rejected for the same reason.

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Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent 6,392,250 to Aziz et al. ('250) further in view of U.S. Patent 6,566,807 to Fujita et al.

Claim 46 essentially recites the same limitation of claim 23 and hence is rejected for the same reason.

### ***Response to Arguments***

Applicant's arguments with respect to claims 2,4,25 have been considered but are moot in view of the new ground(s) of rejection.

### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (571) 272-2463. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S.R.

Sikha Roy  
Patent Examiner  
Art Unit 2879

Joseph Williams  
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